AN2142
Application note

ST10F27X firmware development getting started with tasking ST10 toolchain

Introduction

This document provides an introduction to the Tasking toolchain (version v8.5 r1) for the ST10F27x product family. It describes the software environment required to develop an ST10F27x application and summarizes the different steps needed to configure the Tasking development toolset, to build and to debug an application on the target hardware.

Two software examples are supplied with this application note. The first one is a small application demonstrating an input / output toggling function. The required steps to create the project, build and debug it will be described. The second one illustrates another example using interrupts. Both examples are loaded and executed from an external RAM using Tasking RAM monitor.

The application source files are provided within an archived file. This file must be unpacked into a directory before use.

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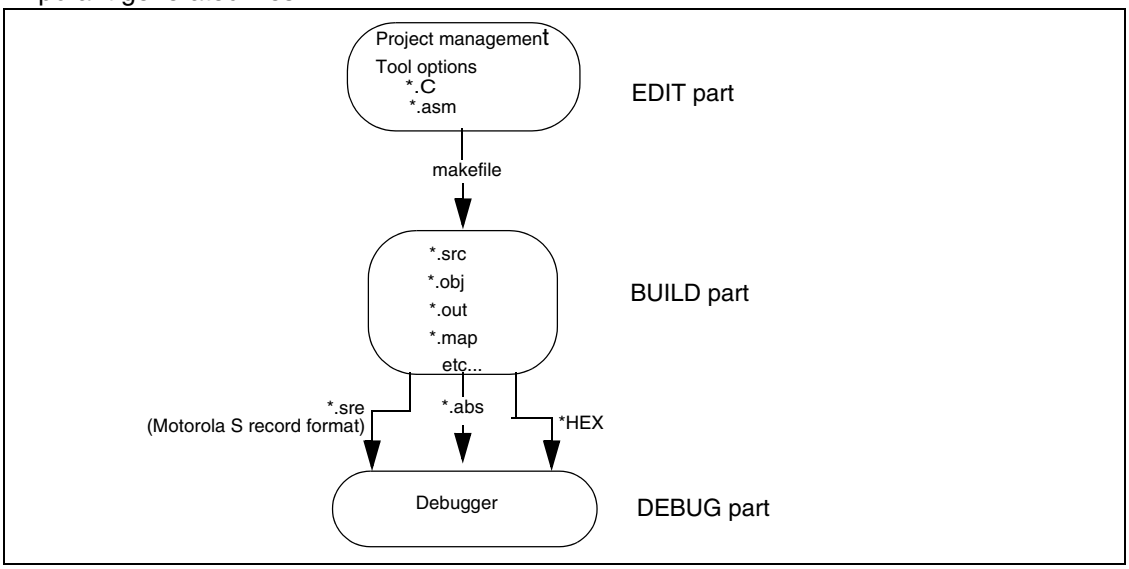
1 Tasking ST10 toolchain

The TASKING Embedded Development Environment EDE can be divided into three main parts:

- Edit / Project management: In this part, projects are created and maintained, project source files are edited etc.
- Build: Here, a makefile (created by the Edit part) is used to invoke the needed toolchain components, resulting in an absolute object file(**.abs*).
- Debug: In this part, the absolute file is used to debug the project.

The figure below shows how these parts interface with each other and enumerates the most imporant generated files.



Neither the toolset installation nor the license management are described in this application note. This section assumes that Tasking is already installed on the development host.

For more details on Tasking installation and license management, refer to Tasking documentation.

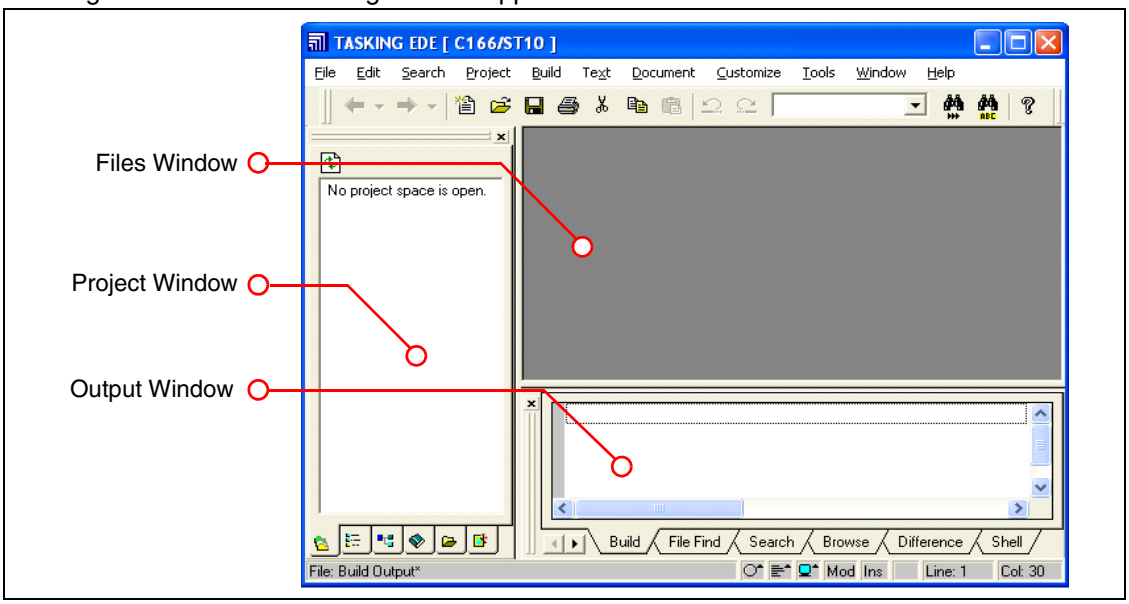
This section describes the steps required for creating, building and debugging an ST10F27x application using the tasking toolchain.

1.1 Starting Tasking development environment (EDE)

Getting started with EDE:

- Select **Start -> Programs ->Tasking C166-ST10** from the Windows **Start** menu.
- Select **C166-ST10 EDE** from the menu

Tasking starts and the following window appears:



The files window is used to edit source files. The project window contains several tabs for viewing information about projects and other files. Finally, the output window contains several tabs to display results of EDE operations such as compiles and builds.

For further information about the window's contents, refer to the Tasking documentation.

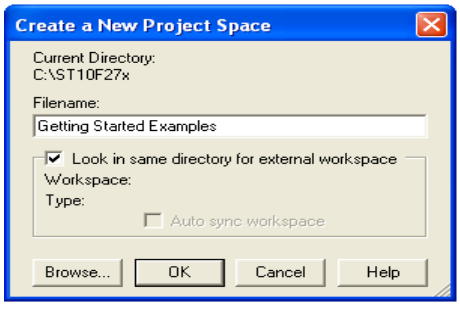
1.2 Creating a new project

When you use EDE, you need to setup a project space and add a project to it. A project space stores a set of projects. It allows multiple projects to be displayed at a time and allows the user to organize projects.

A project space file has the extension *'*.psp'*. A project file has the extension *'*.pjt'*.

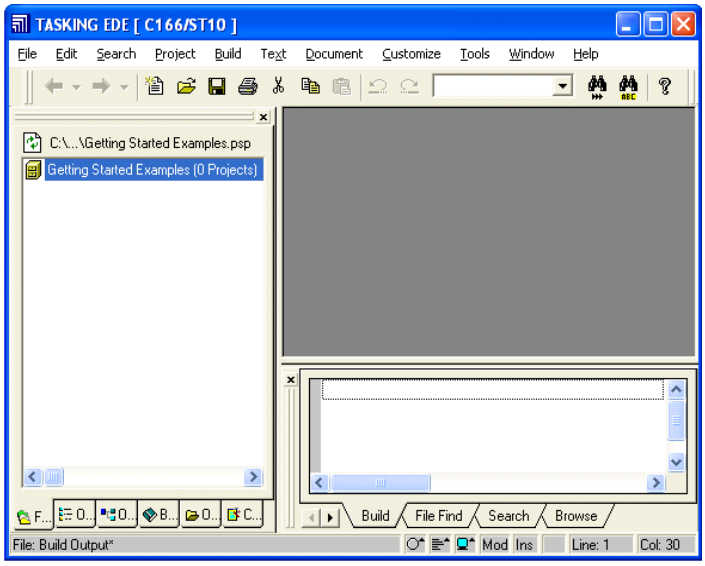
The following steps describe how to create a new project:

- Select **New project space** from the **File** menu. A **Create a New Project Space** dialog box is displayed (see the figure below)
- Use the **Browse** button to select a working directory.
- Enter *'Getting Started Examples'* as the project space name in the **Filename** field.

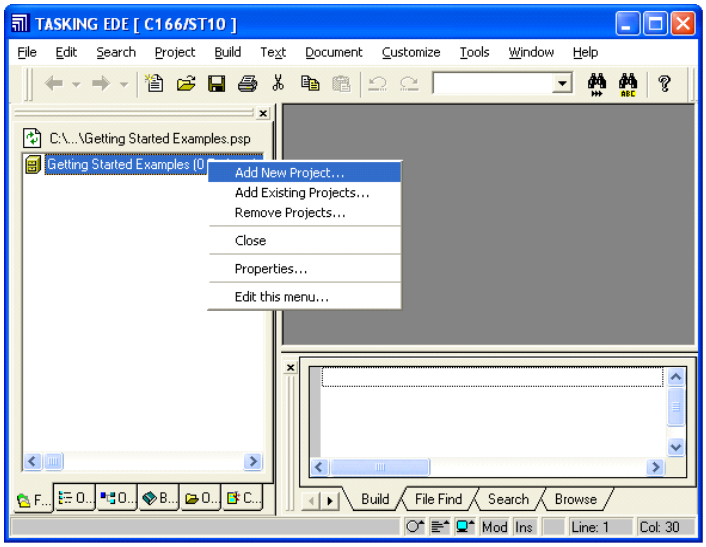


- Click **OK** to confirm your entries and close the **Create a New Project Space** window.

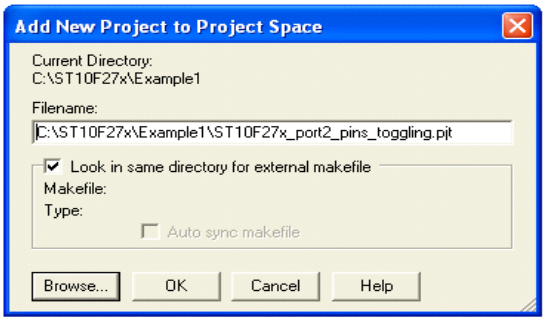
The following window appears:


TASKING EDE [C166/ST10]
File Edit Search Project Build Text Document Customize Tools Window Help
C:\...\Getting Started Examples.psp
Getting Started Examples (0 Projects)
Build File Find Search Browse
File: Build Output*
Mod Ins Line: 1 Col: 30

- Click on '*Getting Started Examples'* and choose **Add New Project**



- An **Add New Project to Project Space** dialog box is displayed (see the figure below)



- Use the **Browse** button to select a working directory.

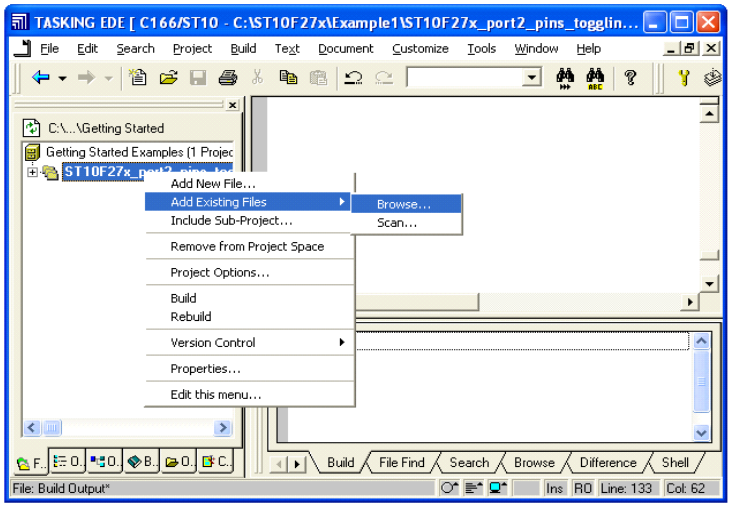
- Enter *'ST10F27x_port2_pins_toggling'* as the project space name in the **Filename** field.
- Click **OK** to confirm your entries and close the **Add New Project to Project Space** window

1.3 Adding files to the project

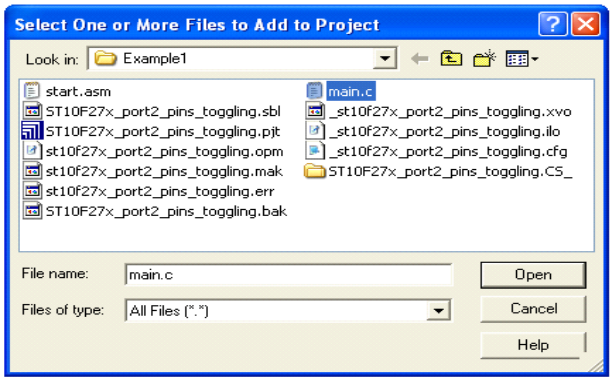
Now, we need to add some source files to the project. This can be done in two ways, either the source file already exists in the working directory (proceed as described in *Section 1.3.1*) or you add new source files and enter your own code (as described in *Section 1.3.2*).

1.3.1 Adding existing files

- Copy in your working directory the *'main.c'* file located in the folder 'Example1' provided with this application note.
- Right-click on *'ST10F27x_port2_pins_toggling'* and choose **Add Existing Files -> Browse**.



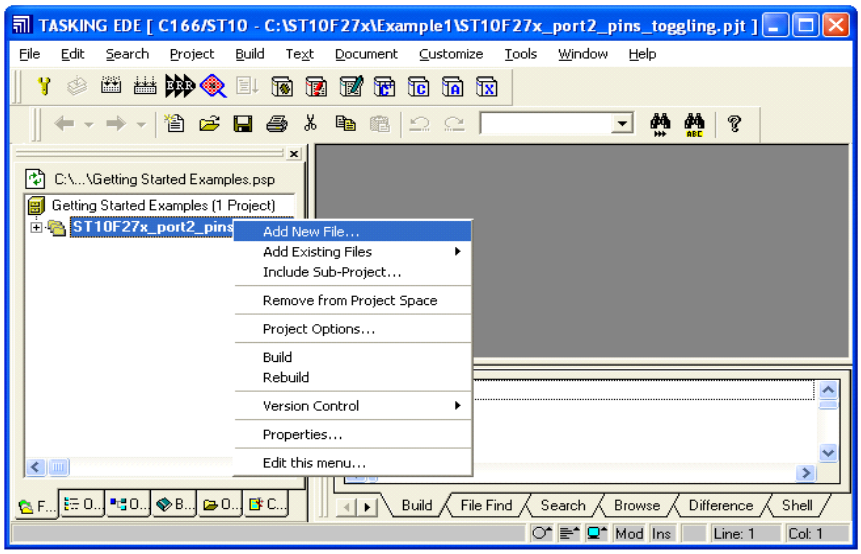
The following window appears:



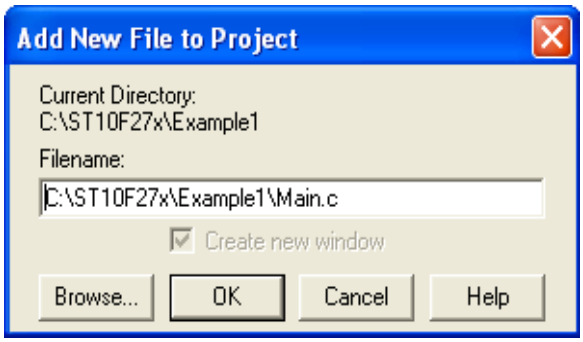
- Choose *'main.c' and* Click **Open** to confirm

1.3.2 Adding new files

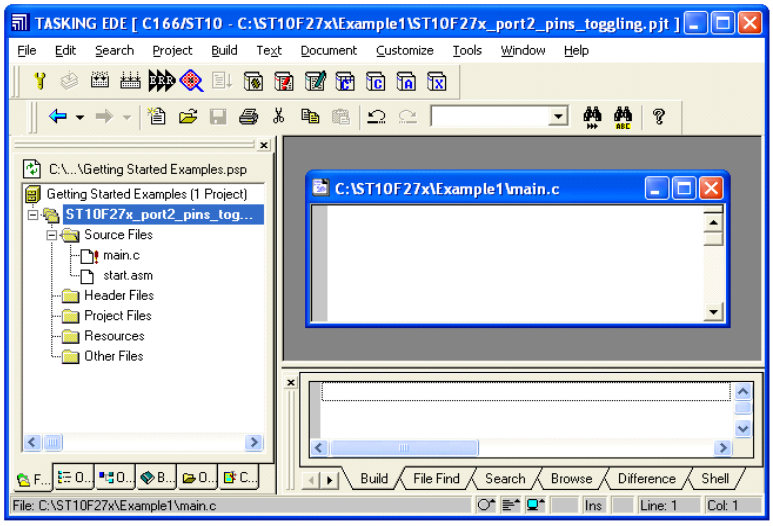
- Right-click on '*ST10F27x_port2_pins_toggling*' and choose **Add New File**



- An **Add New File to Project** dialog box is displayed (see the figure below)
- Use the **Browse** button to select a working directory.
- Enter *'main.c'* as file name in the **Filename** field.



- Click **OK** to confirm your entries and close the **Add New File to Project** window.

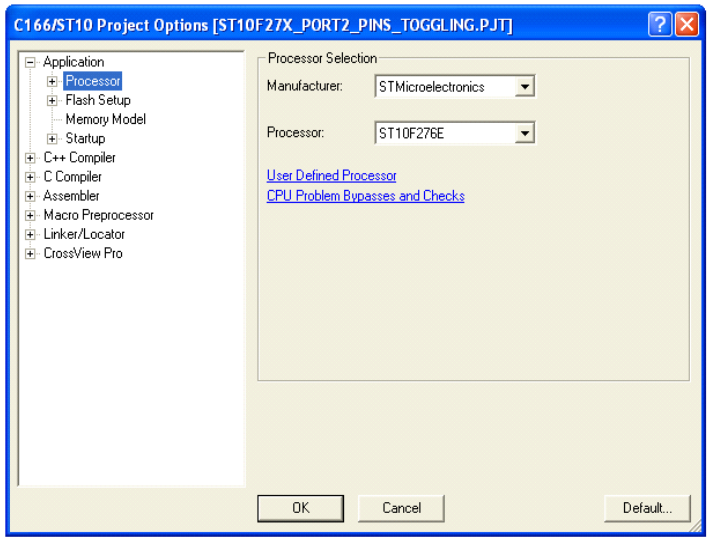


In this project, there is only one source file. If the application requires more than one source file and header files, you have to include them in the project in the same way as '*main.c* ' file.

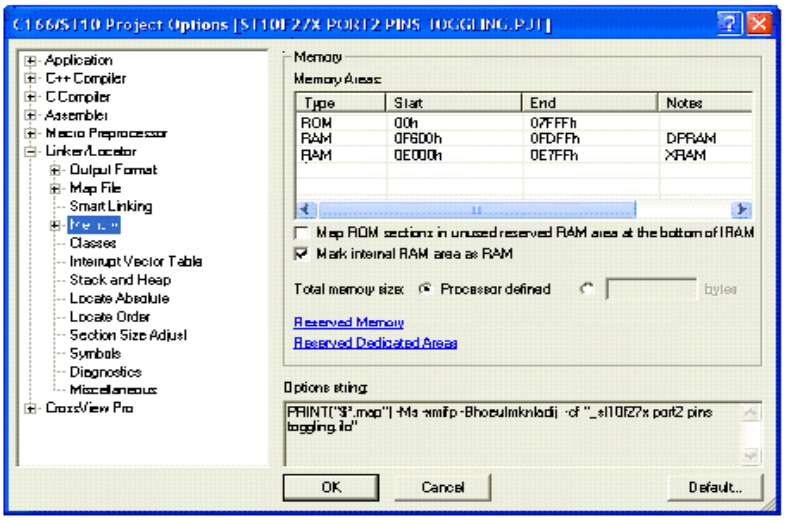
1.4 Setting build options

Before building your project, you should specify compiler and linker options. This section will present the most important options that must be set.

- Select **Project Options** from the **Project** menu. The *Project Options* dialog appears. This dialog contains several entries where you can specify processor and development tool options.
- In the left pane expand the **Application** entry and select **Processor**
- Precise STMicroelectronics as **Manufacturer** and select ST10F27x as **processor**. Let's choose ST10F276 for the example.

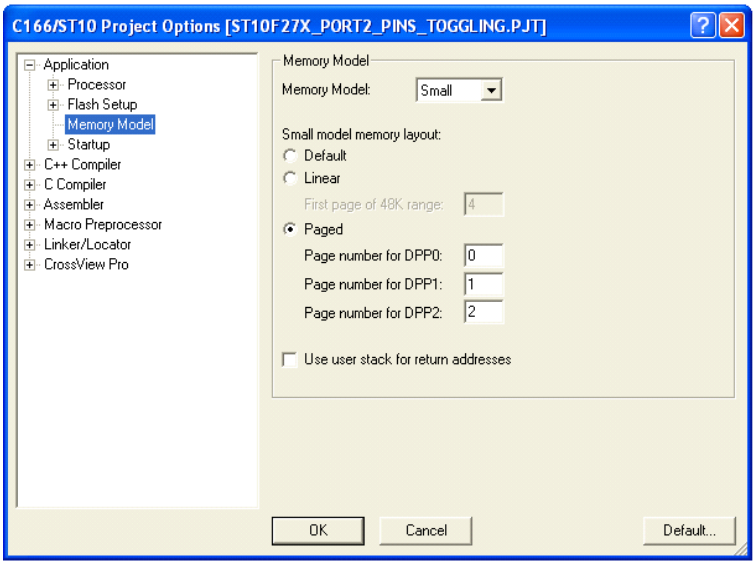


- Now, you have to define the memory mapping. For this purpose, select **Project Options -> Linker/Locator -> Memory**
- Fill in the table using the ST10F276 datasheet , the **Memory Areas** part.



- Select the memory model. For this purpose, select **Project Options -> Application -> Memory Model**

The following window appears:



There are 5 memory models: Tiny, Small, Medium, Large and Huge. The small memory model is used by default.

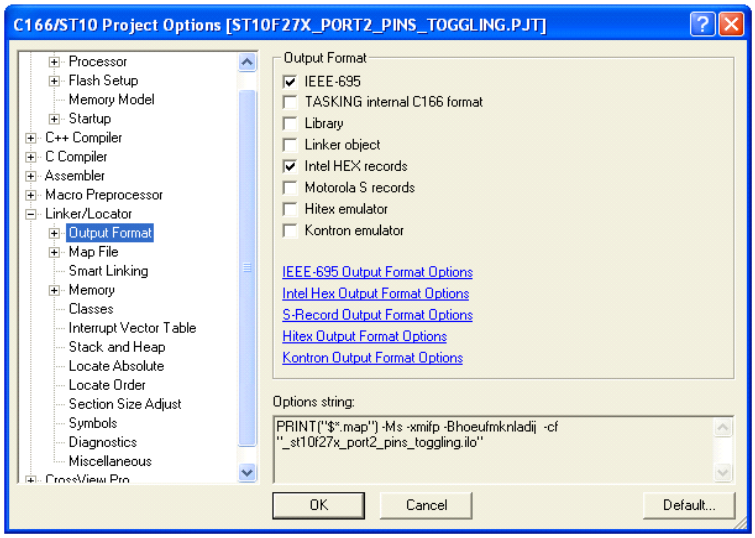
The memory model defines the default variable and function location and their default pointer size. The right selection depends on the application and impacts the compiler efficiency.

The memory models with their characteristics are represented in the following table:

	Data size	Code size	Far/Huge/Shuge data allowed	Near data allowed
Tiny	<64K	<64K	No	Not applicable
Small	<64K	>64K	Yes	Not applicable
Medium	>64K	<64K	Yes	Yes
Large	>64K	>64K	Yes	Yes
Huge	>64K	>64K	Yes	Yes

For more details about memory models and choice criteria, please refer to Tasking documentation.

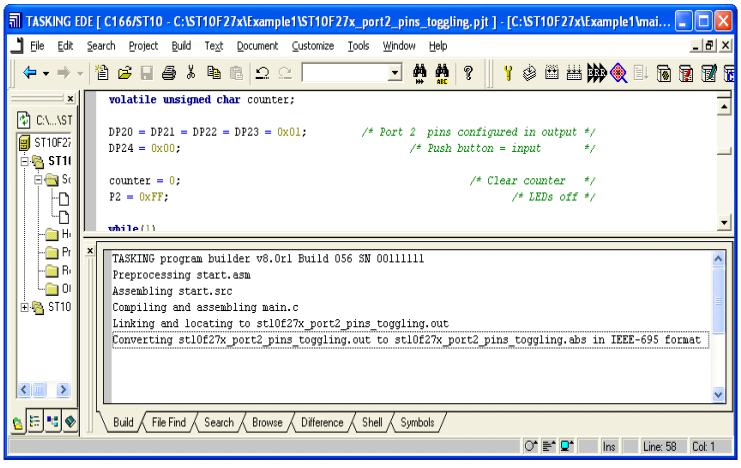
- If you want to generate HEX or Motorla S formats, select **Project Options -> Linker/Locator -> Output Format -> Intel HEX Records** (or **Motorola S records**).



- Hardware configuration: before building the application and starting CrossView, the board configuration must be selected in the dialog 'EDE -> Project Options -> CrossView Pro -> Execution environment". Also, the check box "Use Simulator" must be disabled in this dialog.
  When using one of the default board configurations, there is no need to change the startup registers like SYSCON. With a user-defined configuration, many more settings and startup registers must be initialized, also in the cfg file. Please refer to the cfg file(s) belonging to the default boards for more information.

1.5 Building the application

The project has been configured. You can now build it. Select **Build** from the **Build** menu. If there are no errors, a file.abs will be generated in order to debug the application.


TASKING EDE [C166/ST10 - C:\ST10F27x\Example1\ST10F27x_port2_pins_toggling.pjt] - [C:\ST10F27x\Example1\mai...
File Edit Search Project Build Text Document Customize Tools Window Help
volatile unsigned char counter;
DP20 = DP21 = DP22 = DP23 = 0x01; /* Port 2 pins configured in output */
DP24 = 0x00; /* Push button = input */
counter = 0; /* Clear counter */
P2 = 0xFF; /* LEDs off */
TASKING program builder v8.0r1 Build 056 SN 00111111
Preprocessing start.asm
Assembling start.src
Compiling and assembling main.c
Linking and locating to st10f27x_port2_pins_toggling.out
Converting st10f27x_port2_pins_toggling.out to st10f27x_port2_pins_toggling.abs in IEEE-695 format
Build File Find Search Browse Difference Shell Symbols
Line: 58 Col: 1

When building the application successfully, many files will be generated automatically (as described at the beginning of this document) and placed in the working directory.

1.6 Using the RAM Monitor to debug the application with Cross View debugger

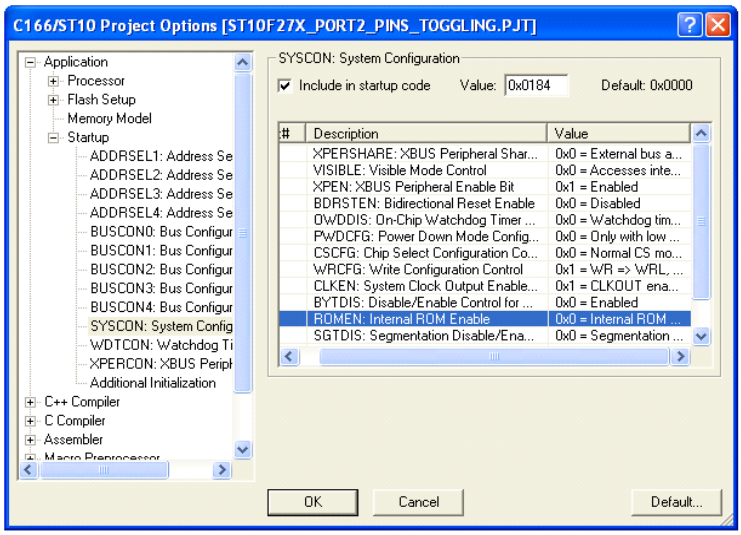
Cross View debugger provides a high level interface between the user and a program running in the target system (execution environment).

Cross View debugger runs on a PC computer and is connected to the ST10F27x target microcontroller via an RS232 interface.

The connection to the target and the debug of the application require that you have successfully compiled and built your application.

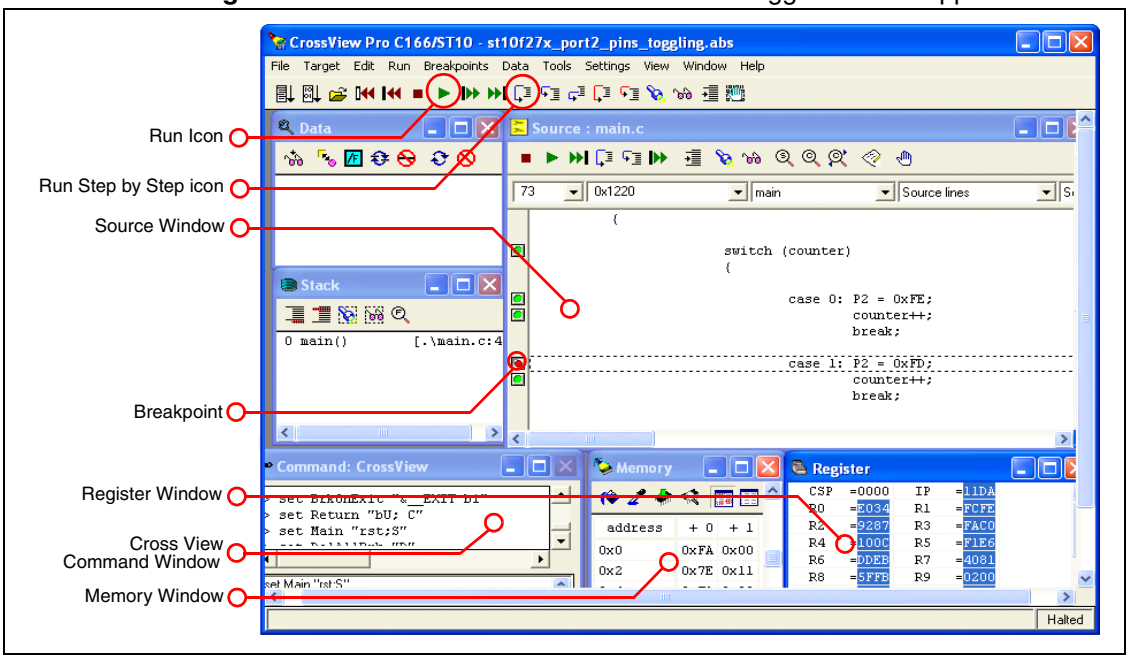
The monitor requires an external RAM memory to run. This RAM memory must be selected at reset.

- External RAM Chip select should be active
- Make sure that ROMEN bit in SYSCON register is cleared (Internal ROM is disabled)


C166/ST10 Project Options [ST10F27X_PORT2_PINS_TOGGLING.PJT]
Application
Processor
Flash Setup
Memory Model
Startup
ADDRSEL1: Address Se
ADDRSEL2: Address Se
ADDRSEL3: Address Se
ADDRSEL4: Address Se
BUSCON0: Bus Configur
BUSCON1: Bus Configur
BUSCON2: Bus Configur
BUSCON3: Bus Configur
BUSCON4: Bus Configur
SYSCON: System Config
WDTCON: Watchdog Ti
XPERCON: XBUS Periph
Additional Initialization
C++ Compiler
C Compiler
Assembler
SYSCON: System Configuration
Include in startup code
Value: 0x0184
Default: 0x0000
Description Value
XPERSHARE: XBUS Peripheral Shar... 0x0 = External bus a...
VISIBLE: Visible Mode Control 0x0 = Accesses inte...
XPEN: XBUS Peripheral Enable Bit 0x1 = Enabled
BDRSTEN: Bidirectional Reset Enable 0x0 = Disabled
OWDDIS: On-Chip Watchdog Timer ... 0x0 = Watchdog tim...
PWDCFG: Power Down Mode Config... 0x0 = Only with low ...
CSCFG: Chip Select Configuration Co... 0x0 = Normal CS mo...
WRCFG: Write Configuration Control 0x1 = WR => WRL, ...
CLKEN: System Clock Output Enable... 0x1 = CLKOUT ena...
BYTDIS: Disable/Enable Control for ... 0x0 = Enabled
ROMEN: Internal ROM Enable 0x0 = Internal ROM ...
SGTDIS: Segmentation Disable/Ena... 0x0 = Segmentation ...
OK
Cancel
Default...

- Enter the bootstrap loader mode by forcing P0L.4 to 0 at reset

- Select **Debug** from the **Build** menu. The Cross View debugger window appears:



- Once the '*st10f27x_port2_pins_toggling.abs*' file has been loaded on the target, you can debug it. To execute the application, Select **Run** from the **Run** menu of the Cross View window.

You can use breakpoints, a simple double click on a line sets a breakpoint on that location.You can also run the application step by step. You can display memory and register contents. Select **View -> Register** from the Cross View window to display the Register pane or **View -> Memory** from the Cross View window to display the Memory pane. By means of these panes, you can view and set the content of a register and a memory location.

For more details on CrossView debugging features, refer to the Cross View Debugger documentation.

2 Application example: interrupt handling

This section describes a simple ST10F27x software example making use of the interrupts. The application uses Timers' overflow interrupts to generate two square signals with different frequencies on two standard port pins: P2.0 & P2.1.

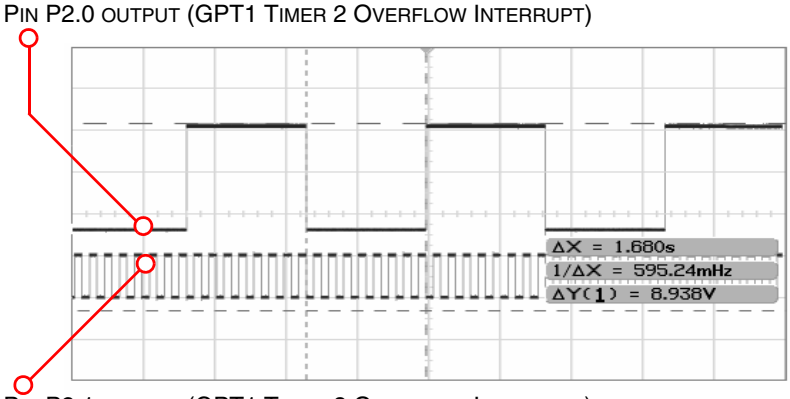
The project contains 3 source files:

- Timer.c: It contains c source code for the following project routines
  - *Configure_GPT1_Timer_2()*: In this routine, GPT1 Timer 2 is set up to operate in Timer mode and is configured to generate an interrupt every 1.678 seconds.
  - *Configure_GPT1_Timer_3()*: In this routine, GPT1 Timer 3 is set up to operate in Timer mode and is configured to generate an interrupt every 104.8 milliseconds.
  - Timer 2 and Timer 3 interrupts' definitions: Timer 2 interrupt is toggling P2.0 while Timer 3 interrupt is toggling P2.1.
- Timer.h: It contains Timer.c routines prototypes.
- main.c: It uses the routines described in Timer.c in order to start the two timer overflow interrupts.

Timings suppose that the chip is operating at a frequency of 40 Mhz.

Both hardware and software environments have been setup as described in the first chapter.

The figure below shows the behaviour of the port 2 pins 0 and 1 and the GPT1 Timer 2 & Timer 3 overflow interrupts.


PIN P2.0 OUTPUT (GPT1 TIMER 2 OVERFLOW INTERRUPT)
ΔX = 1.680s
1/ΔX = 595.24mHz
ΔY(1) = 8.938V
PIN P2.1 OUTPUT (GPT1 TIMER 3 OVERFLOW INTERRUPT)

The example source code is located in the '..\Example2' directory.

For more details about the timers' functionalities, their registers and interrupts' handling, refer to the ST10F27x user's manual.

3 Revision history

Table 1. Document revision history

Date	Revision	Changes
30-Jun-2006	1	Initial release.

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